Wilcox Oil Incremental Sampling Source Area Scope

FINAL 09/21/17 Version

Purpose

Demonstrate and train the EPA Region 6 and Oklahoma Department of Environmental Quality (ODEQ) technical teams on Incremental Sampling and X-Ray Florescence (XRF) methods to assist with site characterization at Wilcox Oil Superfund site. This technical support request is from the Wilcox Oil Remedial Project Manager (RPM) to the Technology Integration and Information Branch (TIIB) and was approved by the RPM on November 29, 2016. EPA Region 6 and the R6 RAC contractor, EPA TIIB, EPA ERT and Oklahoma Department of Environmental Quality (ODEQ) are supporting this project with assistance from TIIB's contractor, ICF, and ERT's contractor, SERAS.

Technical Support Mission & Programmatic Goals

- Applicability to the following Superfund Task Force Recommendations:
    - Recommendation 3 (Use of Adaptive Management): Incremental Sampling and XRF will utilize real-time decision making in the field
    - Recommendation 5 (Encourage Performing Interim/Early Action during RI/FS): Results can be used for interim/early action
    - Recommendation 8 (Use of BMPs in the RI/FS) & 9 (Utilize State-Of-The-Art Technologies): Development of CSM using XRF, and application of incremental sampling and XRF in the RI/FS process

- Incremental Sampling and XRF training opportunity for ODEQ, ERT, EPA Region 6 staff and RAC contractor, for a NPL-listed, fund-lead, RI/FS remedial site

- Unique site characterization approach using a radial incremental sample design to delineate lead (Pb) source area contaminated soils

Deliverable

Develop shape files for the Lead Sweeting Area (LSA) and the Ethyl Blending Area (EBA) sources at the Wilcox Oil Superfund site that provide the boundaries and volumes of soil exceeding the Pb screening level. ICF will assist in developing the work plan, QAPP, SOPs and the shape files using a 3-D graphics modeling program such as Surfer. SERAS will help train and assist with field and XRF work.

Process

This investigation will identify areas where lead concentrations in soil are greater than a screening level of 200 parts per million (ppm). The objective will be to delineate the horizontal and vertical soil contamination down to two feet. An innovative radial composite-block sampling investigation approach will be used in the LSA and EBA to evaluate concentration trends and establish tentative cleanup boundaries.

- Lead Sweeting Area

2015 ERT work indicates a center area with extremely high Pb, and decreasing concentrations away from the center. The contoured figure below is from in situ XRF shots, so the boundary lines should be considered to be highly uncertain, but a useful starting point. The work will involve placement of sufficient transects to find the 200-ppm Pb boundary around the source area, and will consider 2 depths intervals (0-6" and 6-24").

Figure 17-2. Radial transects of SUs in the LSA

Transects will be sampled with a small Sample Unit (SU) with a configuration similar to below. The exact configuration (area covered and number of increments) needed to give reliable results will determined by on-site testing. SU samples will have minimal sample processing prior to XRF analysis.

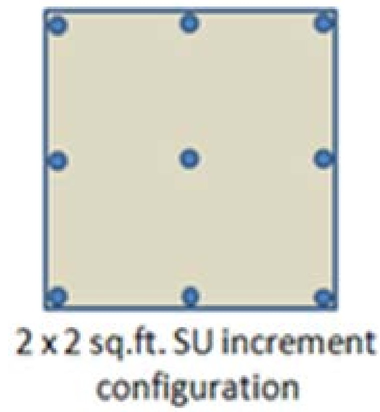


Figure 11-7. SU example.

Initial transect sampling will begin in the center of the source area. A variety of Quality Control (QC) checks will determine the effectiveness of the sampling and analysis design, and refinements will be made as indicated. Sampling along subsequent transects could begin either at the inner or outer ends, whichever finds the 200-ppm boundary with the least amount of effort.

When an SU sample indicates that a segment of the 200-ppm boundary has been located, a 2[nd] SU will be placed nearby to confirm. SU data will be fed into a geostatistical modeling program to produce concentration contour lines similar to the above. Uncertainty in the geostatistical model output will be monitored so that portions of the boundary showing higher uncertainty can be targeted with additional SU samples to close data gaps.

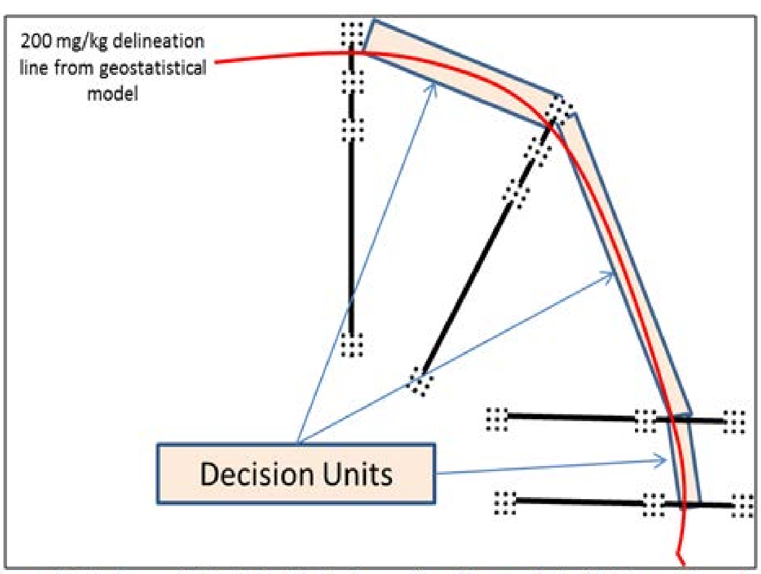


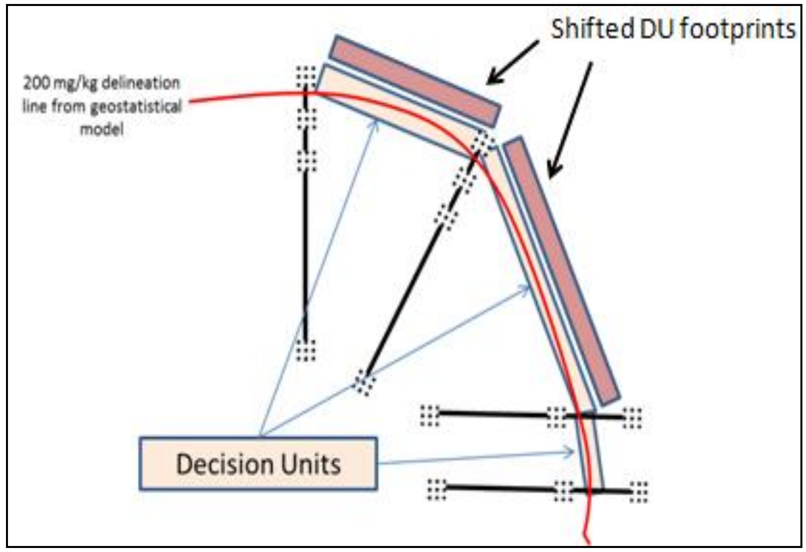
Figure 17-3. Example Decision Units to confirm the modeled 200-ppm boundary

After modeling produces the tentative 200-ppm boundary line, the boundary segments will be confirmed with Decision Units (DUs). DU samples will be processed and sieved to 100-mesh (the <150-micron particle size) to reflect a child's exposure pathway. DUs having predicted UCLs exceeding 200 ppm will have their footprint moved outward and be resampled, as shown in the figures below.

There will be a minimum of 95% statistical confidence in the final completed 200-ppm boundary line. This will be accomplished by using the 95% upper confidence limit on the mean (UCL) for each boundary segment DU.

Basic calculation of the 95% Upper Confidence Limit (UCL) requires triplicate incremental samples within each DU. The LSA area could have as many as 15 boundary DUs. If each had field triplicates, and if some step-out DUs were needed, this could require the collection, processing and XRF analysis of over 50 individual DU samples. Therefore, a mathematical prediction of the UCL will be used for many of the DUs. This will reduce the workload to less than half, while maintaining the statistical confidence goals for this project.

The factors used to mathematically predict the UCL for individual DUs not having triplicate samples will be derived from the first several DUs to be sampled, which will have actual triplicate field samples. The reliability of UCL prediction will be checked using periodic field triplicates as QC.



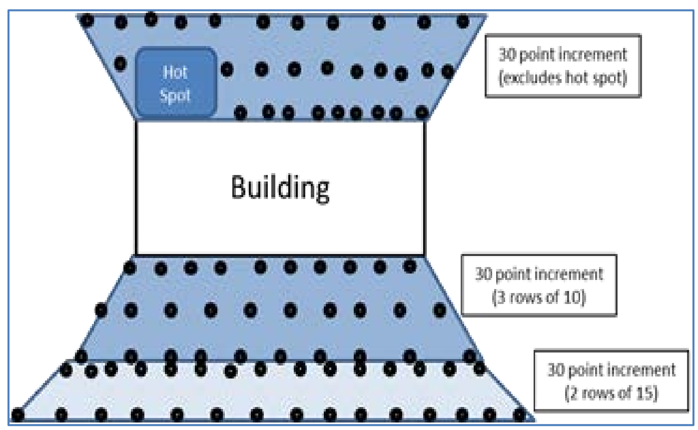
- Ethyl Blending Area (EBA)

The EBA was where tetraethyllead was blended into the gasoline. There XRF data collection in 2015 was extremely limited, so it is highly uncertain whether there is soil contamination or not around the two buildings. Locations of potential leaks (e.g. piping and valves) will be identified for targeted sampling, either by small area SUs or by TIIB's hand-held XRF. If Pb concentrations >200 ppm are found, the non-compliant area will be delineated. If "hot spots" are not found, DUs that cover one side of a building (with a width of about 10 ft) will be placed and sampled to determine whether Pb is >200 ppm. If such DUs are found, step-out DUs will be placed and sampled.

Two XRFs (TIIB's hand-held/benchtop and ERT's benchtop) are to be used; the two instruments are known to produce comparable results. XRF will be the sole analytical method for Pb:

1) Both XRFs show no bias relative to certified reference materials.

2) Because the mechanism for contamination produced a somewhat soluble form of Pb, comparison between XRF and ICP is highly likely to find that the ICP Pb comparability with XRF Pb is >90% (i.e., more than 90% of the total Pb in the sample is solubilized by the ICP sample digestion procedure). Even if the ICP results are <90% those of Pb, use of the XRF results adds a reasonable level of conservatism to boundary decisions.



<u>Equipment List</u>

Trailer and Conex Storage Box – Already at the Wilcox site, EA (RAC Contractor) rents this equipment
Generator – EA or ICF will rent this equipment
Niton XRF – TIIB owns this instrument
Olympus XRF – ERT owns this instrument
12 Pogo Samplers – Region 4 will loan these samplers
Soil Probe Samplers – ICF will rent this equipment
Slide or Electric Impact Hammer – SERAS or ICF will rent this equipment
#10 and 100 Sieves – EA/SERA/ICF will rent this equipment
Decontamination Supplies (3 Buckets, DI Water, Brushes, Spray Bottles and Foil): SERAS or ICF will provide this equipment

Sample Locating Supplies (Pin Flags or Spray Paint, 100-foot Fiberglass Tape, Measuring Wheel and GPS with 2 to 3' accuracy): EA/SERA/ICF will provide this equipment
Digital Scale: at least one with readability to 0.1 gram, and at least one with capacity to at least3 kg
Sample Preparation Equipment (2 Rubber mallets, butcher paper, 4 cookie trays, scotch tape, permanent markers, Nitrile gloves, dust masks and eye protection; 50 additional heavy duty Ziploc gallon-sized plastic bags) – ICF or SERAS will provide this equipment

Implementation Personnel
Katrina Higgins-Coltrain, EPA Region 6, RPM and Project Lead
Todd Downham, ODEQ, RPM
Matthew Jefferson, EPA OSRTI-TIIB, Sample Collection, XRF Support, Training Support and HQ Coordination Lead
Deana Crumbling, EPA OSRTI-TIIB, XRF and Incremental Sampling & Training Lead
Henry Gerard, EPA OSRTI-ERT, Sample Collection, XRF Support and Health & Safety Officer
Josephine Yousefan Martin, EPA OSRTI-ERT, Sample Collection and XRF Support
Joseph Bundens, EPA OSRTI-ERT, Sample Collection and XRF Support
James Rice, ICF International (Contractor to OSRTI/TIIB), Data Analysis and Training Support, and ICF Project Lead
Paul Zarella, ICF International, Data Analysis and Training Support
SERA Contract Personal
EA Contract Personal

Schedule
Draft QAPP for R6/OSRTI review by September 22nd
Travel to Tulsa, OK on October 23rd
Set-up XRF and Clear Vegetation on October 24th
Site Characterization Field Activities from October 25th through November 9th (6 days on-1 day off cycle; off days on October 29th and November 5th)
Demobilize on the afternoon November 8th
Return travel day on November 9th

Estimated Cost and Level of Effort
- Labor

TIIB: 361 hours (2 Full-Time Staff X 19 days X 9.5 hours)
ERT: 361 hours (2 Full-Time Staff X 19 days X 9.5 hours)

- Extramural Funds

TIIB: $60,000 through ICF (Work Plan, QAPP, equipment and 2 field staff to assist with training and data analysis)
ERT: $25,000 through SERA (Health & Safety, equipment and 1 field staff to assist with sample collection)